

information management using one-dimensional code patterns will not always be sufficient in a semiconductor devices with only limited space available for recording information are handled.

Please amend the paragraphs on page 5, spanning line 12 to page 6 line 10 as follows:

In order to achieve the objects stated above, in a first aspect of the present invention, a semiconductor device is provided that is characterized in that a two-dimensional code or matrix code pattern for information management is projected and exposed as chip ID information on each of the chips arrayed on the wafer surface. It is to be noted that since chip ID information is provided in the two-dimensional code pattern, it becomes possible to make use of chip information that is inherent to each chip.

Since the quantity of information that can be recorded per unit area of a two-dimensional code pattern is very large and recognition utilizing an optical apparatus can be implemented with ease, marking can be made on each of the chips arrayed on the wafer surface, which has not been possible in the prior art, so the information management can be easily implemented for chips on an individual basis.

In addition, as a method for marking a two-dimensional code pattern on each chip, projection and exposure may be implemented by employing a liquid crystal mask capable of changing transmitted patterns for different exposures to provide different chip ID information for each wafer using the same mask.

In order to achieve the objects described above, in a second aspect of the present invention, a semiconductor device is provided that is characterized in that marking is implemented with two-dimensional code patterns for information management as framed ID information on lead frames to which semiconductor chips are bonded. It is to be noted that in the

frame ID information in the two-dimensional code pattern, chip positional information indicating the position of chips within the frame and the chip ID information may be included.

Please amend the paragraph on page 6 spanning lines 18-30 as follows:

In order to achieve the objects described above, in a third aspect of the presentation, a semiconductor device that is characterized by that marking for information management is implemented with a two-dimensional code pattern as product ID information on the outer surface of a package of resin-sealed semiconductor chips. It is to be noted that in the product ID information recorded in the two-dimensional code, additional information and chip ID information corresponding to each of the resin-sealed chips can be included. With this structure, even in a state in which chips cannot be visually checked after molding, information management can be implemented for each chip.

Please amend the paragraph on page 7 spanning line 29 to page 8 line 2 as follows:

As explained above, by using the chip ID information, the frame ID information and the product ID information that are coded through two-dimensional code patterns in the inter-process physical distribution during the semiconductor manufacturing processes, detailed management can be implemented for individual chips, thereby making it possible to establish a semiconductor manufacturing facility that is capable of supporting production of many different types of products in small quantities with a high degree of flexibility.

Please amend the paragraph on page 8 spanning lines 20-22 as follows:

FIG. 1 illustrates a schematic structure of an embodiment of a two-dimensional matrix code that may be adopted in the present invention:

Please amend the paragraph on page 8 spanning lines 25-27 as follows:

FIG.3 illustrated an embodiment of a two-dimensional matrix code pattern forward on a semiconductor chip according to the present invention;

Please amend the paragraph on page 8 spanning lines 28-31 as follows:

FIG. 4 illustrated an embodiment of the liquid crystal mask employed to project and expose a two-dimensional matrix code pattern on a semiconductor chip according to the present invention;

Please amend the paragraph on page 9 spanning lines 16-20 as follows:

FIG. 10 is a block diagram illustrating the schematic structure of a die bonder that is capable of adding a two-dimensional; matrix code pattern to a lead time during the bonding step according to the present invention;

Please amend the paragraph on page 10 spanning lines 7-9 as follows:

FIG. 17 illustrates a state in which character information and a two-dimensional matrix code pattern are printed at the package;

Please amend the paragraph on page 10 spanning line 33 to page 11 line 17 as follows:

First, in FIG. 1, an example of a two-dimensional barcode or matrix code pattern which may be employed in an embodiment of the present invention is shown. As shown in the figure, a two-dimensional barcode or matrix code pattern 10 is a two-dimensional pattern in which

specific information can be recorded by coloring the squares 11 of a grid in black or white to form blocks that extends two-dimensionally in conformance to predetermined rules. It is to be noted that while the encoding rules for coloring the grid black and white in the two-dimensional pattern may be the same as those in the prior art, new encoding rules may be created instead. A detailed explanation of the actual method for coloring the grid black and white is omitted since it does not bear direct relevance to the contents of the present invention. However, since data error detection can be encoded as part of the encoding rules, and in that case, errors when reading two-dimensional barcode patterns recorded at individual chips, individual frames and individual resin-sealed semiconductor chips can be reduced, as detailed later.

Please amend the paragraph on page 12 spanning line 4-9 as follows:

In contrast, the inventor of the present invention has observed that the two-dimensional barcode or matrix code pattern adopted in the present invention provides the following superior features compared to the character information patterns and one-dimensional barcode patterns in the prior art.

Please amend the paragraphs on page 12 spanning line 29 to page 13 line 5 as follows:

The inventor of the present invention has conducted focused research into the features of the two-dimensional code patterns described above, which has cumulated the completion of the present invention, which achieves efficient and accurate information management in the inter-process physical distribution in the semiconductor manufacturing processes by utilizing two-dimensional code patterns at various stages in the semiconductor manufacturing processes.

The following is a detailed explanation of embodiments in which two-dimensional barcode i.e. matrix codes according to the invention are used at various stages in the semiconductor manufacturing processes.

Please amend the paragraphs on page 13 spanning line 7 to page 14 line 31 as follows:

In this embodiment in the wafer process, two dimensional code patterns 30 as chip ID information, i.e., two-dimensional code patterns 30-1, 30-2 and 30-3, are recorded at specific positions (lower left positions in the figure, for instance) of individual chips 31-1, 31-2, and 31-3 respectively formed in each wafer, as shown in FIG. 3. The chip ID information may be recorded during the photolithography step for wiring that is implemented near the end of the wafer process, for instance, by projecting and exposing the two-dimensional code pattern corresponding to the chip ID information at the specific position of each chip during projection and exposure.

FIG. 4 shows an embodiment of the liquid crystal mask that is employed to project and expose the chip ID information on each chip. This liquid crystal mask 40 is capable of changing the liquid crystal arrangement of the individual grid squares to render a light-transmitting light-blocking pattern corresponding to the two-dimensional code pattern on the mask surface. In a chip ID generating unit 41, chip ID information such as the product name, the lot ID and the chip positional coordinates for each chip is obtained. In a two-dimensional code conversion unit 42, the chip ID information transmitted from the chip ID generating unit 41 is converted to a two-dimensional code pattern. A liquid crystal driver 43 changes the light transmitting/light blocking pattern in the individual grids formed by the liquid crystal mask 40 as appropriate, and the light transmitting light blocking pattern which is converted to a two-dimensional code pattern at the